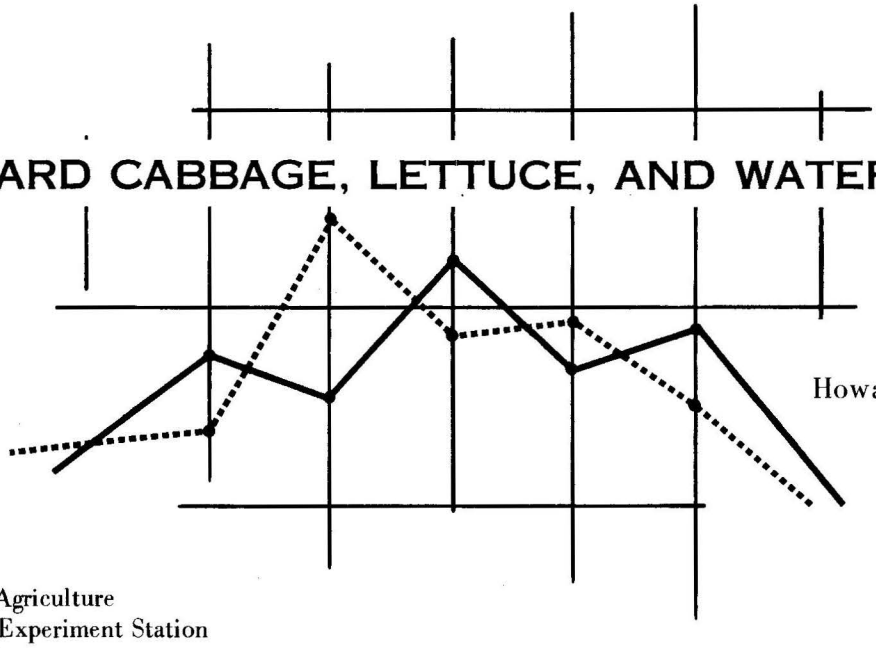
HONOLULU MARKET PROJECTIONS FOR SELECTED DIVERSIFIED CROPS:

MUSTARD CABBAGE, LETTUCE, AND WATERMELON



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This paper is the first of three that report the results of statistical supply-demand projections of several diversified crops occupying over 10 acres of Oahu land in 1971.[1] The series will cover 16 of the 21 crops included in this category. The projections assume no significant changes in technology other than the trends already established in the supply areas. A further assumption is that no changes in State policies occur which might enhance or limit the competitive position of Hawaii farmers. In other words, the estimates predict where diversified agriculture is heading under presently evolving conditions, rather than where it could be in the future under certain shifts in technology or changes in State agricultural policies.

The projections are based on functions estimated from yearly historical data covering the 22-year period ending in 1971. Estimates of supply and demand levels for the years 1972, 1973, 1974, 1975, and 1980 are presented. Projected market components, where applicable, include:

1. Honolulu market demand for specific crops—estimated from total quantity marketed, population, and income variables.
2. Honolulu market supply grown on Oahu—estimated from quantity marketed from Oahu, Honolulu wholesale price, and the ratio of farm-to-contract construction wages (based on wage series reported by the Hawaii State Department of Labor and Industrial Relations).
3. Honolulu market supply grown on the neighbor islands—functionally identical to Oahu-grown supply except for the quantity variable.
4. Imports are estimated as the difference between Honolulu demand and the sum of Oahu and neighbor island supply.

Total Honolulu market supply is the sum of the Oahu-grown supply sold in Honolulu, plus neighbor island supply and imports sold in the Honolulu market.

The estimated and actual production of each crop on Oahu during the study period is illustrated in Figures 1, 2, and 3. These graphs can be viewed as indicative of the estimated functions ability to "predict" production and demand levels.

Mustard Cabbage

Ninety-three percent of the 1971 Honolulu market supply of mustard cabbage was Oahu grown. Because nearly all of the market supply originates on Oahu, the demand and supply relations are nearly equal; the Oahu-grown

[1] The forms of the equations used are similar to those estimated on a statewide basis by Renaud (*1*). However, since publication of the Renaud study, population estimates upon which it was based have been revised and more recent information has become available, resulting in the need for the present study.

In cooperation with the Natural Resource Economics Division, Economic Research Service, United States Department of Agriculture

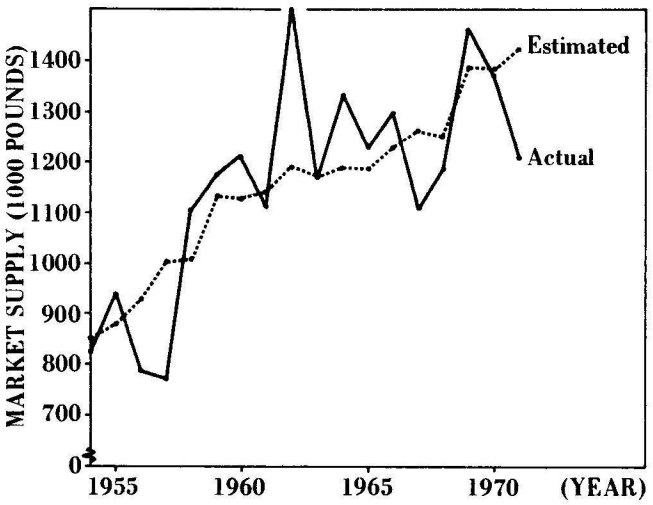

FIGURE 1. Oahu-Grown Mustard Cabbage Sold on the Honolulu Market, 1954-71.

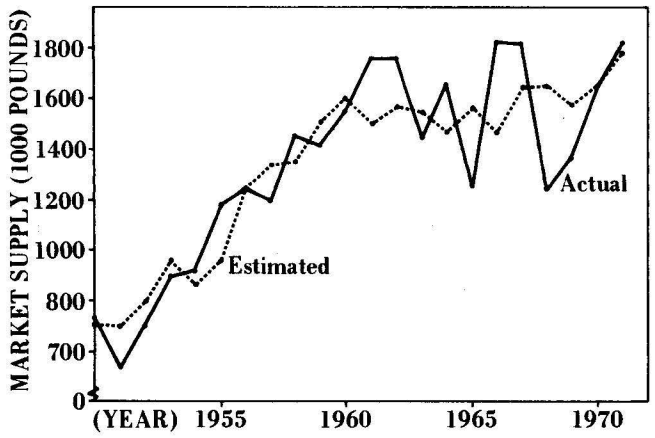

FIGURE 2. Oahu-Grown 'Manoa' Lettuce Sold on the Honolulu Market, 1950-71.

supply is assumed to equal 95 percent of total supply. Table 1 presents the market supply and demand projections to 1980. The assumption of a stabilized Oahu production beyond 1975 leads to a growing gap between supply originating on Oahu and demand beyond 1975. Based on limited available data it appears that imports from the Mainland will make up the difference.

Lettuce

The Honolulu market supply of 'Manoa' lettuce (semi-head) has historically been grown on Oahu. This product represents about 14 percent of the total Honolulu lettuce market, which includes both head and semi-head lettuce. To evaluate this crop, total lettuce demand, Oahu supply of 'Manoa' lettuce, and the neighbor island supply of head lettuce to the Honolulu market are projected. The difference between market demand and the sum of Oahu and neighbor island supply provides an estimate of imports. Table 2 contains projections of the different supply and demand components for the Honolulu lettuce market to 1980.

Watermelon

Forty-three percent of the Honolulu market supply of watermelon was Oahu grown in 1971; mainland imports accounted for 41 percent. The historical pattern of production on Oahu is shown in Figure 3. Table 3 contains the Honolulu market projections to 1980.

A slow decline in per capita consumption of watermelons from the current level of 8.3 pounds is predicted. This decline, predicted by the estimated demand function, will reach 7.0 pounds per capita by 1975. This level of consumption is about half the U.S. average.

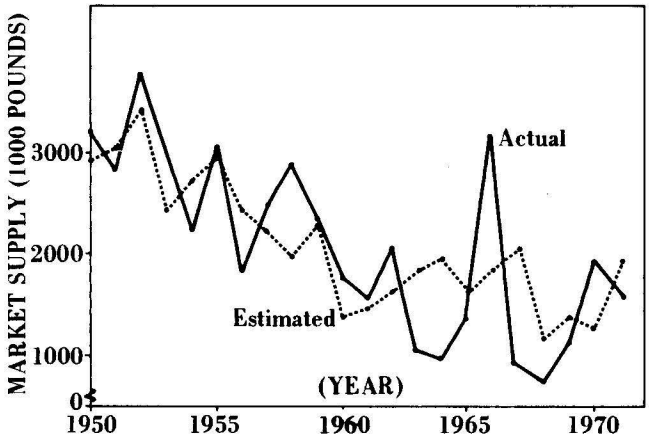

FIGURE 3. Oahu-Grown Watermelon Sold on the Honolulu Market, 1950-71.

Statistical Summary

The statistical form of the equations employed in making the above projections is discussed in detail by Renaud (*1*). A Nerlove supply model containing a variable defined as the ratio of farm-to-contract construction wage levels is used individually for Oahu and neighbor island growers supplying the Honolulu market. The demand equations are the special case of the Houthakker-Taylor model in which the coefficient for the change in per capita income (ΔY_t) is not significantly different from the coefficient for lagged income (Y_{t-1}).[2]

Tables 4, 5, and 6 contain the estimated equations used in making the projections presented in Tables 1, 2, and 3, using a wage ratio of .6.

Reference

(1) Renaud, Bertrand M. *The Impact of Economic Growth on the Agricultural Trade Structure of an Island Economy.* Hawaii Agr. Exp. Sta. Research Bulletin 150. August 1971.

[2]See: Renaud (*1*, p. 20).

Table 1. Mustard cabbage: Supply-demand projections, Honolulu, 1972–80

Projection	Year				
	1972	1973	1974	1975	1980
Honolulu per capita demand (pounds)	2.41	2.37	2.33	2.31	2.30
Honolulu total demand[1] (1000 pounds)	1480	1500	1520	1540	1740
Honolulu supply originating on Oahu[2] (1000 pounds)	1410	1420	1440	1460	1460
Honolulu wholesale price (cents/pound)	14.6	14.9	15.2	15.5	17.1
Estimated population[1] (1000)	615	632	649	666	758

[1]Based on Honolulu de facto population estimates which includes visitors present and excludes residents temporarily absent.
[2]Based on function values to 1975 with production assumed to stabilize in subsequent years.

Table 2. Lettuce: Supply-demand projections, Honolulu, 1972–80

Projection	Year				
	1972	1973	1974	1975	1980
Honolulu per capita demand[1] (pounds)	22.91	24.41	25.82	27.16	27.20
Honolulu total demand[2] (1000 pounds)	14090	15430	16760	18090	20620
Honolulu supply originating on Oahu (1000 pounds)	1760	1740	1740	1750	1820
Honolulu supply originating on neighbor islands (1000 pounds)	2340	2360	2390	2430	2670
Imports to Honolulu market[3] (1000 pounds)	9990	11330	12630	13910	16120
Honolulu wholesale price (cents/pound): Head	16.6	16.8	16.9	17.1	18.0
Manoa	21.2	21.7	22.1	22.6	24.9
Estimated population[2] (1000)	615	632	649	666	758

[1]Based on function values to 1975 with per capita demand assumed to stabilize in subsequent years.
[2]Based on Honolulu de facto population estimates which includes visitors present and excludes residents temporarily absent.
[3]Calculated as the difference between Honolulu demand and the sum of Oahu and neighbor island supply.

Table 3. Watermelon: Supply-demand projections, Honolulu, 1972–80

Projection	Year				
	1972	1973	1974	1975	1980
Honolulu per capita demand[1] (pounds)	8.30	7.76	7.38	7.08	7.00
Honolulu total demand[2] (1000 pounds)	5100	4900	4790	4720	5310
Honolulu supply originating on Oahu (1000 pounds)	1530	1480	1450	1420	1300
Honolulu supply originating on neighbor islands (1000 pounds)	390	400	410	410	430
Imports to Honolulu market[3] (1000 pounds)	3180	3037	2940	2880	3570
Honolulu wholesale price (cents/pound)	14.5	14.7	14.9	15.1	16.2
Estimated population[2] (1000)	615	632	649	666	758

[1]Per capita consumption values are estimated by the demand function through 1975. Beyond 1975, per capita consumption is assumed to stabilize.
[2]Based on Honolulu de facto population estimates which includes visitors present and excludes residents temporarily absent.
[3]Calculated as the difference between Honolulu demand and the sum of Oahu and neighbor island supply.

Table 4. Supply functions for Oahu growers selling on the Honolulu market

Crop	R^2	F	Regression coefficients[1]			
			a	Q_{t-1}	P_{t-1}	L_{t-1}
Mustard cabbage	.61	7.26	369.92	.31	53.57	-285.70
				(.20)	(22.34)	(456.34)
Lettuce (semi-head or Manoa)	.75	17.97	1488.60	.36	18.04	-1270.03
				(.19)	(14.82)	(541.01)
Watermelon	.49	5.72	1064.93	.10	-99.33	2824.84
				(.23)	(96.82)	(1297.20)

[1] a = intercept; Q_{t-1} = lagged total quantity marketed (1000 pounds); P_{t-1} = lagged Honolulu wholesale price (cents/pound); and L_{t-1} = lagged ratio of farm-to-contract construction wages. Values in parentheses are standard errors.

Table 5. Supply functions for neighbor island growers selling on the Honolulu market

Crop[1]	R^2	F	Regression coefficients[2]			
			a	Q_{t-1}	P_{t-1}	L_{t-1}
Lettuce (head or iceberg type)	.56	7.65	-763.42	.45	158.10	-930.24
				(.14)	(100.74)	(967.92)
Watermelon	.25	2.03	198.65	.40	10.40	-176.34
				(.22)	(13.27)	(212.34)

[1] Mustard cabbage is not grown on the neighbor islands for sale in Honolulu.
[2] a = intercept; Q_{t-1} = lagged total quantity marketed (1000 pounds); P_{t-1} = lagged Honolulu wholesale price (cents/pound); and L_{t-1} = lagged ration of farm-to-contract construction wages. Values in parentheses are standard errors.

Table 6. Honolulu market per capita demand[1]

Crop[2]	R^2	F	Regression coefficients[3]		
			a	Q_{t-1}	Y_t
Lettuce (total)	.96	219.95	-.81	.86	.001
				(.15)	(.0006)
Watermelon	.31	4.28	4.15	.54	-.0004
				(.20)	(.0005)

[1] A historical de facto population series does not exist for Honolulu; consequently, State de facto population estimates were used in calculating the functions. The per capita projections given in Tables 1, 2, and 3 are stated in terms of Oahu de facto population estimates.
[2] A mustard cabbage demand equation was not estimated, because Oahu growers supply most of the Honolulu market.
[3] a = intercept; Q_{t-1} = lagged per capita consumption (pounds); and Y_t = real personal per capita income (1967 dollars). Values in parentheses are standard errors.

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